U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Eua zebrina

Common Name:

Tutuila Tree snail

Lead region:

Region 1 (Pacific Region)

Information current as of:

06/01/2013

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

> ___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status
>
> ___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species
>
> ___ Range is no longer a U.S. territory
>
> ___ Insufficient information exists on biological vulnerability and threats to support listing
>
> ___ Taxon mistakenly included in past notice of review
>
> ___ Taxon does not meet the definition of "species"
>
> ___ Taxon believed to be extinct
>
> ___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: American Samoa
- **US Counties**: Manu'a, AS
- **Countries**: United States

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: American Samoa
- **US Counties**: Manu'a, AS
- **Countries**: United States

Land Ownership:

Land ownership in American Samoa generally follows a historic village tradition. Large sections of land around each village are controlled by the village for the use of the village residents. All known populations of the Tutuila tree snails are on village lands.

Lead Region Contact:

ARD-ECOL SVCS, Jesse D'Elia, 5032312349, jesse_delia@fws.gov

Lead Field Office Contact:

PACIFIC ISLANDS FISH AND WILDL OFC, Kristi Young, 503 231-6845, kristi_young@fws.gov

Biological Information

Species Description:

The biology of Samoan partulid tree snails has not been extensively studied. However, there is considerable information (reviewed by Cowie 1992) on the partulid tree snails of the Mariana Islands (Crampton 1925a; Hopper and Smith 1992) and the Society Islands (Crampton 1925b, 1932; Murray et al. 1982; Johnson et al. 1986a, b). This family of snails is considered to be ovoviviparous, although viviparity may be a more accurate description, as considerable growth occurs in utero. Some species in the family are known to be self-fertile while other partulids, including *Samoana conica* of Tutuila, rely predominantly on out-crossing (Johnson et al. 1986a). In the genus *Partula*, shell length at birth is 0.12 to 0.14 inches (in) (3 to 3.5 millimeters (mm)) and sexual maturity is attained in less than one year at a shell length of 0.43 to 1.18 in (11 to 30 mm), depending on the species. Adults live about 5 years and give birth about every 20 days, producing about 18 offspring per year (Cowie 1992).

Taxonomy:

The Tutuila tree snail is a member of the family Partulidae, which is widely distributed throughout the high islands of Polynesia, Melanesia and Micronesia in the south- and west-Pacific basin (Cowie 1992). Many of the 123 partulid species (Kondo 1968) are restricted to single islands or isolated groups of islands. The Samoan partulid tree snails are a good example of this endemism. Cowies 1998 taxonomic work is the most recent and accepted taxonomy for this species.

Habitat/Life History:

Cooke (1928) suggested that habitat partitioning may occur among the three partulids of Tutuila. *Samoana conica* and *S. abbreviata* were commonly found on trunks and branches, and the Tutuila tree snail was commonly found on leaves. A similar partitioning of habitat has been reported for the *Partula* of the Society Islands (Murray et al. 1982). The snails are typically found scattered on understory vegetation in forest with intact canopy 33 to 66 feet (ft) (10 to 20 meters (m)) above the ground (Cowie and Cook 1999; Cowie 2001).

Historical Range/Distribution:

The Tutuila tree snail was historically known only from Tutuila.

Current Range Distribution:

The Tutuila tree snail is found on the islands of Tutuila and Ofu (Cowie and Cook 2001).

Population Estimates/Status:

In a 1993 survey, 34 individuals of the Tutuila tree snails were seen alive; 11 at Sauma Ridge at 400 to 551 ft (122 to168 m) in elevation) and 23 on Nu'usetoga Island at 239 ft (73 m) in elevation, about 328 ft (100 m) offshore of Tutuila (Miller 1993). In a 1998 survey, the Tutuila tree snail was seen alive at 30 of 87 survey sites on the main island of Tutuila and at 1 of 58 sites in the Manua Islands (Cowie and Cook 1999; Cowie 2001).

Cowie (2001) compared the long term changes based on observations from his 1998 survey and earlier work done in 1993 (Miller 1993), 1975 (Solem 1975; Christensen 1980), and pre-1975. Of 12 endemic terrestrial species recorded alive in 1975, living individuals of five species and the shells of two additional species were seen in 1993. In 1998, 11 species were seen alive and shells from one additional species were found. Cowie (2001) characterized 3 of these 12 species as being stable in numbers and the rest were described as declining in numbers, including all 4 of the *Partula* species found in American Samoa. These survey data indicate that the native snail fauna is declining and that the partulid tree snails and several other terrestrial and arboreal species are of particular concern (Cowie 2001).In recent surveys

of Tau and Ofu (Cowie and Cook 1999, 2001), the Tutuila tree snail was discovered on the island of Ofu. Eighty-eight individuals were recorded at the single locality. Ofu does not yet have the rosy carnivore snail (*Euglandina rosea*) (see section on Disease or Predation below). Hence the Ofu population of the Tutuila tree snail is of major conservation significance.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

The decline of the native tree snails in American Samoa has resulted, in part, from significant loss of native habitat to forestry and agriculture, loss of native forest structure to hurricanes, and the establishment of alien weeds after these storms. These threats may interact to greatly exacerbate the loss of populations and species. All live Tutuila snails were found on understory vegetation beneath intact forest canopy. No snails were found in areas bordering agricultural plots or in forest areas that were severely damaged by three hurricanes (1987, 1990, and 1991) (Miller 1993). Under natural historic conditions, loss of forest canopy to storms did not pose a great threat to the long-term survival of these snails, and enough intact forest with healthy populations of snails would support dispersal back into newly regrown canopy forest. However, the presence of alien weeds such as *Mikania micrantha* (mile-a-minute vine) may reduce the likelihood that native forest will become reestablished in areas damaged by the hurricanes (Whistler 1992). This loss of habitat to storms is greatly exacerbated by expanding agriculture needed to support one of the worlds highest human population growth rates (Craig et al. 1993). Agricultural plots on Tutuila have spread from low elevation up to middle and some high elevations on Tutuila, significantly reducing the forest area and thus reducing the resilience of the native forest and its populations of native snails. Loss of forest habitat also increases the likelihood that future storms will lead to the extinction of populations or species that rely on the remaining canopy forest.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

None known.

C. Disease or predation:

At present, the major existing threat to long-term survival of the native snail fauna in American Samoa is predation by the nonnative rosy carnivore snail, the most commonly recommended biological control agent of the giant African snail (*Achatina fulica*). Numerous studies show that the rosy carnivore snail feeds on endemic island snails and is a major agent in their declines and extinctions (van der Schalie 1969; Hart 1978; Hadfield and Mountain 1981; Howarth 1983, 1985, 1991; Clarke et al. 1984; Pointier and Blanc 1984; Hadfield 1986; Murray et al. 1988; Hadfield et al. 1989, 1993; Kinzie 1992; Cowie 2001).

At Sauma Ridge, the rosy carnivore snail was found alive within meters of endemic snail species (Miller 1993). Shells of the Tutuila tree snails and another Samoan partulid (*Samoana conica*) were found on the ground at several of the locations surveyed on Tutuila, along with numerous shells and an occasional live

rosy carnivore snail individual (Miller 1993). The population of Tutuila tree snails on Nuusetoga Island was probably isolated from an ancestral parent population on the main island of Tutuila in prehistoric time. No live rosy carnivore snails were found on this offshore islet (Miller 1993). Thus, the Tutuila tree snails on this island are, for the moment, safe from predatory snails. However, predation by rats (*Rattus* spp.) is a problem, and several rat-damaged shells were found (Miller 1993).

Recent surveys recorded partulid tree snail shells that were damaged in a fashion that is typical of rat predation; the shell is missing a large piece of the body whorl or the apex. Old shells may be weathered in a similar fashion, except that the fracture lines are not sharp and angular. Signs of rat predation were seen at Sauma Ridge and Nu'usetoga Island (Miller 1993). Studies in Hawaii (Hadfield et al. 1993) have shown that both rats and the rosy carnivore snail can quickly devastate tree snail populations. Live trapping in Hawaii has implicated the Polynesian rat (*Rattus exulans*), although the black rat (*R. rattus*) and the Norway rat (*R. norvegicus*) may also be significant threats to native snail populations. All three rat species have been introduced throughout the Pacific islands.

In addition, predation by the Manokwar flatworm (*Platydemus manokwari*) is a likely threat to the Tutuila snail. The Manokwar flatworm has contributed to the decline of native tree snails, due to its ability to ascend into trees and bushes that support native snails. Areas with populations of the flatworm usually lack partulid tree snails or have declining numbers of snails (Hopper and Smith 1992). The predatory flatworm is reported on Tutuila (Tulafono 2006, pers. comm.).

D. The inadequacy of existing regulatory mechanisms:

The Tutuila snail currently receives no protection under the Federal Endangered Species Act (16 U.S.C. §1531-1544), or from the government of American Samoa.

E. Other natural or manmade factors affecting its continued existence:

None known.

Conservation Measures Planned or Implemented :

American Samoas Department of Marine and Wildlife Resources are currently in the planning stages of conducting a tree snail assessment project which will include gathering data on the distribution and abundance of tree snails throughout Tutuila, American Samoa. Additionally, a mark recapture study may be implemented to investigate population demographics of target species. These surveys are intended to focus on the Tutuila tree snails, including *Eua zebrina*. Information on the distribution and abundance of non-native predatory snails will also be collected.

Summary of Threats :

Based on our evaluation of habitat degradation and loss and the effects of predation, we conclude that there is sufficient information to develop a proposed rule for this species due to the threat of habitat destruction or alteration by agriculture and nonnative invasive weeds, and predation by the rosy carnivore snail and rats. In addition, predation by Manokwar flatworms, is a likely threat to the Tutuila snail. We find that this subspecies is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing

Decisions(PECE)?

Recommended Conservation Measures :

- Develop and implement long-term monitoring surveys for the Tutuila snail
- Develop and implement nonnative predatory snail removal and control program
- Develop and implement nonnative flatworm removal and control program
- Control and remove nonnative rat populations
- Conduct habitat restoration and remove invasive plants species

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2**
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

This species is highly threatened throughout its limited range by habitat loss and alteration and by predation from nonnative predatory snails and rats. In addition, the Tutuila snail is likely threatened by a nonnative predatory flatworm. The small number of individuals and the small number of populations also make this species very susceptible to the negative effects of random natural events such as typhoons and drought. These threats occur range-wide.

Imminence :

Threats to the Tutuila tree snail from habitat loss and predation by rats and the rosy carnivore snail are ongoing and thus considered to be imminent.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of the Tutuila snail as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

Description of Monitoring:

We conducted literature searches for recent articles on this species and contacted relevant species experts, and University of Hawaii researchers regarding the current status of this species. No new information was found. Existing data regarding the species status was verified.

This level of monitoring is appropriate to update the status of the species because a thorough literature search was conducted and relevant species experts were contacted. Information contained in this assessment form was verified and any updated information incorporated.

This species is listed as endangered (EN) in the International Union for Conservation of Nature and Natural Resources (IUCN) Red Data List database (IUCN 2006). The Tutuila snail is included in the list of species in American Samoas Comprehensive Strategy for Wildlife Conservation (Department of Marine and Wildlife Resources Revised 2006).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

American Samoa

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

On February 22, 2013, we sent a letter to the American Samoa Department of Marine and Wildlife Resources requesting their review and comment on our most recent candidate assessment of this species. No additional information or comments were received.

Literature Cited:

Christensen, C.C. 1980. Preliminary summary of the terrestrial mollusks of Tutuila, American Samoa. B.P. Bishop Museum, unpublished report.

Clarke, B.C., J.J. Murray, and M.S. Johnson. 1984. The extinction of endemic species by a program of biological control. Pacific Science 38:97-104.

Cooke, C.M. 1928. Food habits of *Partula zebrina* Gould. Bull. B. P. Bishop Museum 47:5-12.

Cowie, R.H. 1992. Evolution and extinction of Partulidae, endemic Pacific island land snails. Phil. Trans. R. Soc. Lond. B 335:167-191.

Cowie, R.H. 1998. Catalog of the nonmarine snails and slugs of the Samoan Islands. Bishop Museum Bulletin in Zoology 3. Bishop Museum Press, Honolulu. viii plus 122 pp.

Cowie, R.H. 2001. Decline and homongenization of Pacific faunas: the land snails of American Samoa. Biological Conservation 99:207-222.

Cowie, R.H., and R.P. Cook. 1999. The distribution and abundance of land snails in the National Park of American Samoa, with particular focus on Partulidae. Cooperative National Park Resources Studies Unit, Hawaii, Technical Report 123:i-iii, 1-143.

Cowie, R.H., and R.P. Cook. 2001. Extinction or survival: partulid tree snails in American Samoa. Biodiversity and Conservation 10:143-159.

Craig, P., P. Trail, G. Grant, J. Craig, and D. Itano. 1993. American Samoa: Natural History and Conservation Topics. Volume 1. Biological Report Series, Report Number 42. Department of Marine and Wildlife Resources, American Samoa Government.

Crampton, H.E. 1925a. Studies on the variation, distribution, and evolution of the genus *Partula*. The species of the Mariana Islands, Guam and Saipan. Carnegie Inst. Washington Publ. 228a, vii, 116 pp.,14 pll.

Crampton, H.E. 1925b. Contemporaneous organic differentiation in the species of *Partula* living in Moorea, Society Islands. Am. Nat. 59:5-35.

Crampton, H.E. 1932. Studies on the variation, distribution, and evolution of the genus *Partula*. The species inhabiting Moorea. Carnegie Inst. Washington Publ. 410, vi, 335 pp., 24 pll.

Department of Marine and Wildlife Resources, American Samoa Government. 2006. A comprehensive strategy for wildlife conservation in American Samoa. September 2005, Revised November 2006. 116 pp.

Hadfield, M.G. 1986. Extinction in Hawaiian achatinelline snails. Malacologia 27:67-81.

Hadfield, M.G., S.E. Miller and A.H. Carwile. 1989. Recovery plan for the O'ahu tree snails of the genus Achatinella. U.S. Fish and Wildlife Service 300 Ala Moana Blvd., Honolulu, Hawaii 96850.

Hadfield, M.G., S.E. Miller, and A.H. Carwile. 1993. The decimation of endemic Hawai'ian tree snails by alien predators. Am. Zool. 33(6):610-622.

Hadfield, M.G., and B.S. Mountain. 1981. A field study of a vanishing species, *Achatinella mustelina* (Gastropoda, Pulmonata) in the Wai'anae Mountains of O'ahu. Pacific Sci. 34:345-358.

Hart, A.D. 1978. The onslaught against Hawaii's tree snails. Natural History 87(10):46-57.

Hopper, D.R., and B.D. Smith. 1992. The status of tree snails (Gastropoda: Partulidae) on Guam, with a resurvey of sites studies by H.E. Crampton in 1920. Pacific Science 46:77-85.

Howarth, F.G. 1983. Classical biocontrol: Panacea or Pandora's box? Proc. Hawaiian Entomol. Soc. 24:239-244.

Howarth, F.G. 1985. Impacts of alien land arthropods and mollusks on native plants and animals in Hawaii. In Stone, C.P., and J.M. Scott (eds.), Hawaii's terrestrial ecosystems: preservation and management. Cooperative National Park Research Studies Unit, Honolulu, Hawaii. Pp. 149-179.

Howarth, F.G. 1991. Environmental impacts of classical biological control. Ann. Rev. Entomol. 36:485-509.

IUCN 2006. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org. *Eua zebrina*, accessed on April12, 2007.

Johnson, M.S., J.J. Murray, and B.C. Clarke. 1986a. High genetic similarities and low heterozygosities in land snails of the genus *Samoana* from the Society Islands. Malacologia 27:97-106.

Johnson, M.S., J.J. Murray, and B.C. Clarke. 1986b. An electrophoretic analysis of phylogeny and evolutionary rates in the genus *Partula* from the Society Islands. Proc. R. Soc. Lond. B. 227(1247):161-177.

Kinzie, R.A. 1992. Predation by the introduced carnivorous snail *Euglandina rosea* (Ferussac) on endemic aquatic lymnaeid snails in Hawaii. Biological Conservation 60:149-155.

Kondo, Y. 1968. Partulidae: preview of anatomical revision. Nautilus 81:73-77.

Miller, S.E. 1993. Final report on surveys of the arboreal and terrestrial snail fauna of American Samoa. Unpublished report to the U.S. Fish and Wildlife Service, Pacific Islands Office, Honolulu, Hawaii. 30 pp.

Murray, J.J., M.S. Johnson, and B.C. Clarke. 1982. Microhabitat differences among genetically similar species of Partula. Evolution 36:316-325.

Murray, J.J., E. Murray, M.S. Johnson, and B.C. Clarke. 1988. The extinction of *Partula* on Moorea. Pacific Science 42:150-153.

Pointier, J.D., and C. Blanc. 1984. *Achatina fulica* en Polynesie Francaise. Situation en 1982-83 en Polynesie Francaise apres l'introduction des escargots geants en 1967. Centre de l'Environment, Moorea, Rapport RA13. 42 pp.

Solem, A. 1975. Final report, Office of Endangered Species. Contract No. 14-16-0008- 837.

van der Schalie, H. 1969. Man meddles with nature - Hawaiian style. The Biologist 51:136-146.

Whistler, W.A. 1992. Vegetation of Samoa and Tonga. Pacific Science 46:159-178.

Personal Communications and In Litteris

Tulafono, U.R., Director, Department of Marine Wildlife Resources, American Samoa, Email in response to request for review of candidate assessment forms. September 5, 2006.

Tulafono, U.R., Director, American Samoa Department of Marine and Wildlife Resources. Emailed letter dated March 31, 2011, regarding the Departments response to candidate assessment forms. Received April 4, 2011.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  06/13/2013
Date

Concur:  10/28/2013
Date

Did not concur: _____ _____
Date

Director's Remarks: